Index Membership and Capital Structure: International Evidence*

Vidhan K. Goyal[†] Daniel Urban[‡] Wenting Zhao[§]

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ABSTRACT

How much do shocks to the information environment in equity markets matter for debt supply and the financing of firms? We find that the use of debt increases by about two to three percentage points following exogenous additions of stocks to an index. The leverage response is primarily in public debt markets: Borrowing costs in these markets decrease, while bond liquidity increases. These results suggest that index additions affect leverage because an increase in public information reduces information asymmetries for lenders and increases their willingness to buy information-sensitive debt. Indeed, stocks added to an index are followed by more equity analysts. Overall, we support the view that information production in equity markets spills over into debt markets.

JEL classification: G14, G15, G32

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[†]Vidhan K. Goyal, Department of Finance, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong. `goyal@ust.hk`

[‡]Chair of Financial Management and Capital Markets, Technical University of Munich, Arcisstr. 21, 80333 Munich, Germany `daniel.urban@tum.de`

[§]Chair of Financial Management and Capital Markets, Technical University of Munich, Arcisstr. 21, 80333 Munich, Germany. `wenting.zhao@tum.de`

I. Introduction

Investigating and monitoring informationally opaque borrowers is both costly and imperfect. Thus, an important research question is to determine the extent to which information frictions and supply considerations affect debt financing of firms. We make progress on this question by examining shocks to the information environment that result in greater firm transparency. If information asymmetries are critical for lending, then debt levels should increase as a firm becomes less opaque. How important are information frictions in debt supply considerations? Do they matter for leverage?

To address these questions, we examine exogenous additions and deletions of stocks to equity indices that cause large and dramatic shifts in a firm's information environment. As a firm becomes a part of a major stock index, it becomes better known and more visible. Ownership by institutions increases as they often benchmark to these indices. Institutions value public information, which results in greater demand for analyst services. Institutions also specialize in monitoring and evaluating firms, which further increases the amount of information produced on indexed firms. Overall, we expect index membership to result in a richer information environment for firms.[1]

As the information environment improves, monitoring and screening costs incurred by lenders go down. Consequently, firms become less constrained in their ability to issue debt. This can happen directly through a quantity channel because lenders are willing to lend more when transparency increases. But, it can also happen indirectly through a price channel as firms now have greater access to cheaper capital. While index membership may facilitate purchases by institutional investors and specialized funds that require firms

[1] See, for example, Boone and White (2015) or Crane et al. (2016).

whose debt they purchase to be a member of an index, we are more interested in the information effects in equity markets and how they spill over to debt markets.

In particular, we expect arm's length lenders with coarser and more costly screening and monitoring technologies to now find it feasible to lend. Firms that previously could only borrow from financial intermediaries with an information advantage (such as banks) could now access public debt markets.[2] In fact, Faulkender and Petersen (2006) suggest that a firm's visibility is important in its ability to issue public debt. If a firm is better known and more visible, it is easier for investment banks to sell their bonds to investors. Thus, we expect shocks to the information environment to matter more for the amount of public debt that firms can issue.

From a theoretical perspective, the effects of equity index membership on capital *structure* are not clear. Even though firms may find it easier to increase debt levels following equity index membership, leverage may nevertheless decrease because the cost of equity may be more sensitive to *equity* index membership than the cost of debt. According to the pecking order theory of debt (Myers, 1984), information frictions result in the hierarchy of financing—internal funds, debt, and then equity. Ultimately, the empirical question is then whether firms are operating at the internal funds versus debt margin or at the debt versus equity margin. Leverage increases would be consistent with firms being at the first margin, while firms operating at the debt issuance versus equity issuance margin are expected to switch from debt issuance to equity issuance. Leverage increases, for example, would also be consistent with the trade-off theory of debt (Kraus and Litzenberger, 1973). In this view, firms are under-levered because of financial frictions. A reduction in those frictions allows firms to move towards their optimal debt ratios.

[2] Banks are good at investigating and monitoring borrowers because they interact with borrowers over time and across different products, which gives them a unique advantage in collecting information about firms (Leland and Pyle, 1977; Diamond, 1984; Fama, 1985; Boyd and Prescott, 1986).

Ideally, we would like firms to be randomly assigned to an index so that we can infer causal effects of indexing on debt ratios. In practice, index membership is often based on firm size and past performance. This makes firms that are added to an index different compared to firms not in the index.[3] Furthermore, given that index ranking methodologies and review dates are well known, firms could influence index membership by increasing size through acquisitions, for example.

We overcome these difficulties by only considering changes in index membership that result from (1) the formation of a new equity index or discontinuation of an existing index, (2) changes in the eligible index universe, such as country and industry, (3) increases or decreases in the number of index constituents, or (4) changes in index selection criteria or changes in criteria weightings. We construct this sample by screening more than 54,000 press releases (including archived press releases) related to 7,356 equity indices from 32 major index providers across 21 countries. This results in a sample of more than 200 events that satisfy our screening criteria affecting 8,000 (treatment) stocks. Compared to previous literature that exploits the quasi-random assignment into Russell 1000 and 2000 stock indices, our approach entails the advantage that changes in index methodology and the creation of new indices are usually announced on relatively short notice.[4] For example, in our dataset, index changes, formations, or discontinuations are announced on average 44 days (median: 23 days) before the index event, while the exact stocks that are affected by the event are announced only 25 days later (median: 1 day). The events are also of meaningful importance. For example, for the subset of indices that are newly created, the market capitalization of the stocks included in the index amounts to about 15% of a country's total market capitalization at that point of time. In comparison, at

[3]Becker-Blease and Paul (2006) show that stocks to be included in the S&P 500 index had both higher return on assets and higher returns compared to their control group in the year prior to inclusion.

[4]See, for example, Chang et al. (2014), Boone and White (2015), Crane et al. (2016), and Schmidt and Fahlenbrach (2016).

the end of 2015, the market capitalization of the Dow Jones Industrial Average Index amounted to about 21% of the total market capitalization of U.S. firms. Thus, we can exploit these exogenous changes in index membership for identification purposes.

We show that firms added to an index increase leverage by about 2-3 percentage points relative to control firms that are observationally identical to treatment firms on country, industry, year, and various firm characteristics. Furthermore, we find that much of the increase in leverage around index additions can be attributed to an increase in public debt. In contrast, private debt ratios show no statistical change following index additions. In addition, we observe that borrowing costs in public debt markets decrease relative to control stocks, while bond liquidity increases simultaneously. The results are in line with the view that index additions have a stronger impact on a firm's ability to access public debt. Public debt investors for whom monitoring is more costly exhibit a greater supply response as a firm's information environment improves, and firms increase their issuance of public debt relatively more compared to bank debt as they can access external debt markets.[5]

We find that the main result is robust to alternative estimation methodologies. In particular, we implement a regression discontinuity design that compares firms that, based on the underlying index methodology, have just been included in the index to firms that just have not been included in the index. This gets us closer to a quasi-random selection into treatment and non-treatment stocks. Based on this approach, we observe comparable magnitudes of leverage increases around index additions.

While our approach benefits from the suddenness of the index announcements, which makes it difficult for firms to actively influence index membership (in contrast to the Russell 1000/2000 threshold), index providers may have an incentive to create or change

[5]See, for example, Krishnaswami and Subramaniam (1999) or Gomes and Phillips (2012).

indices so that they include “winner” stocks but exclude “loser” stocks and, accordingly, they will set the size of a new or modified index to reflect these expectations. Thus, index inclusion around the threshold might not be random. Therefore, in a robustness test, we restrict the dataset to index families whose indices all have the same number of constituents and index families whose constituents are selected from the same universe of stocks and the same ranking methodology. In these cases, it is less likely that index size is driven by future expectations from a single industry. In addition, we restrict the dataset to indices with a round number of index constituents (e.g., 20, 30, 50, 100, etc.) and only look at a small number of stocks around the index inclusion threshold. When doing so, index providers will not always be able to perfectly distinguish stocks with good prospects from those with bad prospects. Even though the number of observations drops considerably, we still observe a positive and highly significant effect of index inclusion on leverage. Thus, we conclude that our main result does not stem from strategic index creation by index providers.

In the second part of the paper, we conduct several tests to shed light on the underlying mechanisms. Around the exogenous addition to an index, we find that the number of analysts following a firm increases relative to control stocks, which is consistent with the notion that index membership increases investor awareness and reduces information costs. In line with Boone and White (2015), we also document that liquidity cost, approximated by average relative bid-ask spreads, decrease relative to control stocks when a stock is exogenously included in an index. Finally, we exploit the cross-country variation by examining how institutional differences across countries amplify debt responses to changes in information environment. We expect shocks to the information environment to engender a greater debt response in countries with weak disclosure laws and worse accounting standards. This is because greater production of public information by investors and analysts is of greater value when the overall information environment is weak. Consistent with this argument, we find that leverage increases in response to exogenous additions to an index are smaller for firms in countries with stronger disclosure requirements and better accounting standards. These results support the view that incremental effects of greater public information production are greater when firms are operating in a relatively poor information environment.

The paper adds to the literature along several dimensions. First, the paper contributes to the growing literature on the supply of debt financing as an important determinant of capital structure (Faulkender and Petersen, 2006; Leary, 2009; Tang, 2009; Sufi, 2009; Rice and Strahan, 2010; Saretto and Tookes, 2013). Second, the paper contributes to the literature on how information asymmetry affects debt financing (Leland and Pyle, 1977; Myers, 1984; Chang et al., 2006). Third, by looking at exogenous effects of equity index events on debt financing, we can shed light on the underresearched interplay of equity and bond markets (e.g., Campbell and Ammer, 1993; De Jong and Driessen, 2012). We provide evidence that significant spill overs occur from equity markets to bond markets. Fourth, we add to the literature that exploits changes in index membership for identification. In contrast to previous literature that looks at the Russell universe (e.g., Chang et al., 2014; Boone and White, 2015; Crane et al., 2016; Schmidt and Fahlenbrach, 2016), we examine index creations or changes in index methodology. Finally, related to work such as Rajan and Zingales (1995) or Korajczyk and Levy (2003), we are able to document international variation in the "index effect", helping to understand whether the institutional environment affects corporate financing decisions.

In a recent paper, Cao et al. (2016) examine the effects of financing decisions for a sample of small U.S. firms around the Russell 2000 threshold. They find that, as a result of lower information acquisition cost, index membership lets firms issue more equity. In contrast to their findings, we find that equity index membership results in more public debt, highlighting the interplay of equity and debt markets. Cheung et al. (2017) find that increases in stock liquidity due to decimalization and Russell index reconstitutions result in higher leverage. In contrast, we argue that greater information production as a result of index membership reduces adverse selection costs, which lets firms borrow more. Furthermore, we follow a different empirical approach by looking at exogenous changes in index membership due to index formations or index methodology changes. Compared to regular updates to Russell 2000 membership, these events are even more difficult to influence for firms, e.g., because of the suddenness of their announcement. Finally, due to the internationality of our dataset, we can document cross-country variation in the effects of index membership on corporate financing decisions. Our paper is also related to Michaely et al. (2014) who argue that the increased presence of institutional investors such as mutual funds can help to explain the deleveraging of U.S. firms since 1992. In contrast, Lu (2013) argues that that institutional ownership reduces bank loan spreads, facilitating borrowing.

The remainder of this paper is organized as follows. In Section II, we describe our identification strategy. Section III presents the data. In Section IV, we discuss the empirical results. Section V concludes.

II. Identification

Indices are usually constructed based on publicly available information. Furthermore, most index providers disclose their index methodology in a transparent way that one can easily reconstruct by using market data provided by established data vendors. Hence, many studies have employed equity index revisions for event studies (e.g., Harris and

Gurel, 1986; Erwin and Miller, 1998; Becker-Blease and Paul, 2006). These events, however, are subject to endogeneity concerns. First, firms can influence index revision results and, therefore, index membership because index review dates and methodologies are very transparent and known in advance. For example, in September 2015, Vonovia SE acquired two firms and, therefore, increased its market capitalization shortly before its inclusion in the DAX, an index of 30 German blue chip stocks. Without the acquisitions by Vonovia SE, ProSiebenSat.1 Media SE, a media firm, would have been included in the DAX instead. Second, around regular index revisions, there may be underlying trends. For instance, stocks to be included in equity indices often grow faster than those not to be included, which is why they are to be included in the first place. In this regard, Becker-Blease and Paul (2006) show that stocks to be included in the S&P 500 index had both higher return on assets and higher returns compared to their control group in the year prior to inclusion. Consequently, index effects measured in the past literature are partially affected by other endogenous factors and do not only reflect effects of index membership itself.

In this paper, we rely on exogenous events affecting index membership. In particular, we look at the following four types of index events:

- We examine formations of new equity indices or discontinuations of existing indices (**launch / closure**). For example, after 2000, Dow Jones launched various country and regional Titan indices consisting of blue chip stocks.

- We study changes in the eligible index universe, such as country and industry (**universe change**). In this regard, NASDAQ-100 first included foreign stocks listed at NASDAQ in 1998, while foreign companies are no more eligible to be included in the S&P 500 since July 2002.

- We analyze increases or decreases in the number of index constituents (**number change**). For instance, the number of constituents of the Dow Jones US Select Dividend Index has been increased from 50 to 100 at the end of 2004.

- We investigate changes in index selection criteria or changes of criteria weightings (**ranking methodology change**). For instance, Dow Jones changed ranking methodologies by reducing the number of index criteria from five to three in 2002 to increase transparency.

The intuition behind exploiting these events for identification is that it is unlikely that firms can anticipate these events and influence index membership in advance because changes in index methodology and the creation of new indices are usually announced on relatively short notice. This makes it very difficult for firms to influence index membership. For example, in our dataset, index changes, formations, or discontinuations are announced on average 44 days (median: 23 days) before the index event, while the exact stocks that are affected by the event are announced only 25 days later (median: 1 day). Therefore, from the perspective of an individual firm that is included in or removed from a certain index for these reasons, index membership is exogenous. Furthermore, even if these index events could be driven by economic development (such as strong growth of the Chinese stock market as driver for introduction of many Chinese stock indices), which could affect a firm's financial leverage decisions (e.g., Baker and Wurgler, 2002), our difference-in-differences approach eliminates these effects by matching within country, year, and industry, as well as performing propensity score matching along several firm characteristics.[6] We also complement the analysis with a regression discontinuity design (RDD) that looks at stocks near the index inclusion threshold that have *just* been included

[6]Firms need to be available throughout the full time window around the index events to be included in the dataset.

in an index to mitigate concerns related to firms anticipating changes in index membership (e.g., Chang et al., 2014; Boone and White, 2015; Crane et al., 2016, for the Russell 1000/2000 indices). For this, we collect information on the index construction criteria and reconstruct the indices in the sample. In doing so, we arrive at the firms that have just not been included in the index.

While our approach benefits from the suddenness of the index announcements, which makes it difficult for firms to actively influence index membership (in contrast to the Russell 1000/2000 threshold), index providers may have an incentive to create or change indices so that they include "winner" stocks but exclude "loser" stocks and, accordingly, they will set the size of a new or modified index to reflect these expectations. Thus, index inclusion around the threshold might not be random. Therefore, in a robustness test, we restrict the dataset to index families whose indices all have the same number of constituents and index families whose constituents are selected from the same universe of stocks and the same ranking methodology. In these cases, it is less likely that index size is driven by future expectations from a single industry. In addition, we restrict the dataset to indices with a round number of index constituents (e.g., 20, 30, 50, 100, etc.) and only look at a small number of stocks around the index inclusion threshold. When doing so, index providers will not always be able to perfectly distinguish stocks with good prospects from those with bad prospects.

III. Data

To identify exogenous index events, we search all available press releases (including archived press releases) from major index providers worldwide. We start with the 45 countries included in the sample by Amihud et al. (2015). However, due to only a small number of exogenous events, a low number of affected stocks, or missing information on index constituents in 24 of the countries, we restrict the sample to index events in 21 countries. We also exclude strategic indices such as short indices, indices that only cover financial firms, and customized indices whose methodologies and constituents are not publicly available. Overall, we identify 226 index events from January 1996 to June 2014, for which we are able to determine index constituents before and/or after the respective events. Index constituents lists are obtained from press releases, Datastream, Bloomberg, or newswires, depending on data availability. An overview of these events can be found in Table I.

— Table I about here —

The 226 events we find are based on the screening of more than 54,000 press releases related to 7,356 equity indices from 32 index providers. After excluding financial firms, the events refer to about 9,000 individual non-financial stocks. To show that the sample of equity indices is representative and not subject to selection bias, we apply the same filtering criteria to the Morningstar database. Thereby, we are able to identify about 8,000 active and dead equity indices as of December 2015, which is close to the number of indices for which we screen press releases.

Table II presents the distribution of the stocks affected by the events across countries, which is also illustrated in Figure I. The 23 stock exchange groups[7] we look at have a total domestic market capitalization of about 62.7 trillion USD as of December 2015, which corresponds to more than 93% of the total worldwide stock market capitalization.[8] About 50% of the index events in the sample do not refer to certain industries, while

[7]For example, we assume that NYSE and AMEX represent one exchange group.
[8]Source: World Federation of Exchanges.

the other indices represent certain business segments such as telecommunications, non-cyclical goods, or food & beverages. About 25% of the indices are branded by the FTSE group. Other important index providers in the sample are the China Securities Index Company (CSI), Dow Jones, and Standard & Poors. About 40% of the indices cover a wide range of firms and do not refer to certain size groups, while 25% refer to large firms. The remaining indices refer to small and medium sized firms.

The index events are of meaningful importance. For example, for the subset of indices that are newly created, the market capitalization of the stocks included in the index amounts to about 15% of a country's total market capitalization at that point of time. In comparison, at the end of 2015, the market capitalization of the Dow Jones Industrial Average Index amounted to about 21% of the total market capitalization of U.S. firms.[9]

— Table II and Figure I about here —

Looking at an international sample of index events entails several advantages. First, most leading equity indices in the United States exist for very long histories and experienced hardly any exogenous changes recently. Second, our sample represents a substantial portion of worldwide stock market capitalization. Therefore, it will allow us to conduct meaningful comparisons among different economic regions and development stages.

For firm financial data, we rely on the Worldscope database. We stick to Frank and Goyal (2009) for variable definitions. Detailed data on debt structure is from Capital IQ. Analyst forecast data is from I/B/E/S. Finally, stock market data is from Datastream. More information on definitions and sources of all variables can be found in Appendix A.

[9] Firm-level market capitalization is taken from the Worldscope database. Country-level stock market capitalization comes from the World Bank database.

A. Difference-in-differences sample

For the empirical analysis, we first construct a difference-in-differences sample consisting of treatment and control group stocks. We define stocks exogenously added to an index from Table I as treatment stocks. When performing the propensity score matching, we select control stocks within the same country, industry[10], and year that have similar size, profitability, tangibility, and market-to-book ratios. The stocks are matched based on all available stocks included in the respective Worldscope country lists except for the treatment stocks. The nearest neighbor for each treated stock is then included in the control group.

Overall, we match 6,463 treated stocks that have exogenously been added to an index. In the last part of this paper, we also look at 700 stocks that have exogenously been deleted from an index. Table III presents descriptive statistics for the difference-in-differences sample before and after the propensity score matching. As suggested by Imbens and Wooldridge (2009), we look at normalized differences between treatment and control stocks. Normalized differences not exceeding a quarter are considered to be not significantly different from zero. After the matching procedure, differences between treated and control stocks become economically small and are not statistically significant. Regarding profitability and tangibility, however, we observe that the normalized differences are close to the threshold of one quarter. Thus, we also apply a regression discontinuity design that compares firms that are close to the index inclusion threshold as well as a Cochran and Rubin (1973) caliper restriction.

— Table III about here —

[10]We apply the ICB supersector classification (2-digits) as industry definition. Our findings hold for ICB sector (3-digits) and subsector (4-digits) classifications as well.

Figure II illustrates the development of mean market leverage and mean book leverage of treatment and control firms around the index events. Year 0 is the fiscal year of the corresponding index event. Leverage is normalized based on year -1. The graphs suggest that treated firms increase both market and book leverage relative to the control firms after index inclusion. It is also important to note that financial leverage in the years before year 0 follows a parallel development for both treated and control firms, indicating that the parallel trends assumption is not violated.

— Figure II about here —

B. Regression discontinuity sample

In addition, we apply a regression discontinuity design around index events for which we are able to replicate stock rankings based on the index methodology guidelines published by the index providers. Overall, we are able to retrieve index ranking methodologies for 128 events with 3,150 stock additions.[11] We restrict the sample to index events with available index methodology guidelines because we can then identify the firms which just have not been included in the index from the eligible firm universe (e.g., all firms in the Datastream Worldscope lists for a given country). These firms will henceforth be referred to as the control stocks.

More specifically, we define n as the number of treated stocks per index event ("bandwidth"). For each index event, we further include the n stocks below the index inclusion threshold as control group. For example, if a new index with 50 stocks has been launched, the "all" bandwidth means that we refer to these 50 stocks as the treated ones, and add,

[11] Unfortunately, due to the low number of observations, we cannot perform a meaningful RDD analysis around stock deletions.

based on the index ranking methodology the next 50 stocks, which have just not been included in the index, as control stocks to the sample. In this regard, a bandwidth of "all" means that the bandwidth is set to the number of all affected stocks for an event. We also perform robustness tests, where we set the bandwidth to "1/2", which means that in the above example we would only take 25 treated and 25 control stocks into account. The advantage of this approach is that we restrict the sample to firms closer to the index inclusion threshold, resulting in a higher degree of exogeneity. However, this procedure also reduces the statistical power of the analysis. In this regard, both bandwidths are consistent with prior literature. For example, Boone and White (2015) look at the ±50 to ±200 firms around the Russell 1000/2000 threshold, while the corresponding numbers for Crane et al. (2016) are ±100 to ±750 firms.

Table IV presents descriptive statistics for the regression discontinuity sample. Overall, mean values for the covariates are close to the ones reported in Table III.

— Table IV about here —

IV. Empirical results

In this section, we first focus on stocks exogenously added to an index. Section A summarizes the difference-in-differences regression results of financial leverage around exogenous index events. Section B presents the results using an regression discontinuity design. Section C examines the robustness of the findings. Section D reports additional results regarding the drivers of the index effects as well as international variation. Section E presents test results for stocks exogenously deleted from an index.

A. Difference-in-differences results

We apply the following difference-in-differences regression:

$$\begin{aligned}\text{Lev}_{i,t} =& \alpha \cdot \text{Treated}_i \cdot \text{Post}_t + \beta \cdot \text{Post}_t + \vec{\gamma} \cdot \vec{X}_{i,t-1} \\ &+ \delta_1 \cdot I_i + \delta_2 \cdot I_t + \delta_3 \cdot I_t \cdot I_j + \delta_4 \cdot I_t \cdot I_k + \epsilon_{i,t},\end{aligned} \tag{1}$$

where $\text{Lev}_{i,t}$ is the market leverage of firm i in year t. Similar to Frank and Goyal (2009), we use market leverage as our main dependent variable because this measure is more forward looking and takes market expectations into account. We also report results using book leverage in Appendix B. Treated_i equals one if firm i belongs to the treatment group, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Post_t equals one if year $t > 0$, and zero otherwise. Index inclusion is in $t = 0$ so that financial statements at the end of that year may already reflect short-term effects of index inclusion.[12] $\vec{X}_{i,t-1}$ is a vector of control variables as suggested by Frank and Goyal (2009). The vector includes the most important determinants of financial leverage, i.e., FIRM SIZE, PROFITABILITY, TANGIBILITY, and the MARKET-TO-BOOK RATIO. Variable definitions are summarized in Appendix A. Control variables are lagged by one year. I_i, I_j, I_k and I_t are firm, industry, country, and year fixed effects. $\epsilon_{i,t}$ is the error term.

Table V exhibits empirical results. The sample is restricted to firm-year observations in the time windows presented in the column titles. The event year (0) is not included in the analysis. According to Models 1-3, which do not consider control variables, firms included in an equity index increase market leverage by 1.3-2.3% compared to control firms with similar firm characteristics. These changes become smaller (1.1-1.7%) when

[12] We perform robustness tests where we set Post_t equal to one if year $t \geq 0$, and obtain similar results.

we take control variables into account (Models 4-6), but the statistical significance of the difference-in-differences term remains at 1%. If we compare years 2 and 3 with year -1 (Models 7 and 8), the increase of financial leverage becomes even greater in magnitude. Overall, we find that firms included in an equity index increase market leverage by 1-2% compared to the control group.

In a robustness test, we also examine whether the results are robust to excluding stocks that are already part of the most important stock index in a country. For this, we search for the most important stock index per country (e.g., the FTSE index for the United Kingdom, the DAX for Germany, or, arguably, the S&P500 index for the U.S. We then download the index constituents from Datastream and exclude treatment stocks that are already part of that index in the year before the index inclusion event.[13] The results can be found in Appendix C. Consistent with the notion that the addition to an index is less important for firms that are already part of an important stock index, we observe in Models 1 to 3 that the effects of index membership are about 0.3 to 1 percentage points stronger when we exclude firms that are already part of an important stock index.

— Table V about here —

To examine the drivers of the changes in leverage, we look at the development of median total debt and median market value of equity around the index events. We normalize both variables based on their values in year -1 for each firm in the sample. The results are displayed in Figure III. The graphs suggest a parallel development of debt and equity until the event year (0) for both treatment and control stocks. While there is only a small increase in normalized equity relative to control stocks after the treatment, the debt level of treatment stocks increases much more relative to the control group. Therefore,

[13]

we conclude that the increase in market leverage is driven by the issuance of new debt. In the following, we examine the robustness of the results and then shed light on why firms increase leverage after being exogenously added to an index.

— Figure III about here —

B. Regression discontinuity results

In this section, we report the results for the regression discontinuity design. The idea behind this approach is to mitigate concerns related to unbalanced treatment and control samples due to the nature of the index assignment procedures that are oftentimes correlated with different proxies of firm size (e.g., market capitalization). The regression discontinuity model is specified as follows:

$$\begin{aligned}\Delta\text{Lev}_{i,t_1,t_2} =& \alpha + \beta \cdot \text{Treated}_i + \vec{\gamma} \cdot \Delta\vec{X}_{i,t_1,t_2} + \sum_{p=1}^{4} \theta_p \cdot D_i^p + \sum_{p=1}^{4} \vartheta_p \cdot D_i^p \cdot \text{Treat}_i \\ &+ \delta_1 \cdot I_j + \delta_2 \cdot I_k + \delta_3 \cdot I_t + \delta_4 \cdot I_t \cdot I_j + \delta_5 \cdot I_t \cdot I_k + \epsilon_{i,t},\end{aligned} \tag{2}$$

where $\Delta\text{Lev}_{i,t_1,t_2}$ is the change of market leverage of firm i from year t_1 to year t_2. α is a constant. Treated_i equals one if firm i belongs to the treatment group, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but are ranked *just* below the inclusion threshold based on the respective index methodologies. $\Delta\vec{X}_{i,t_1,t_2}$ is a vector of changes in control variables from year t_1 to year t_2. D_i is the assignment variable, defined as the threshold of index inclusion minus the index ranking based on the index methodology. Thus, the cutoff point is defined as the ranking of the lowest ranked firm from the treatment group, i.e., $D_i \geq 0$ if firm i belongs to the treatment group, $D_i < 0$ if not. p refers to the order of the polynomial. We employ polynomials of order 1, 2, and 4. I_j, I_k and I_t are industry, country, and year fixed effects. $\epsilon_{i,t}$ is the error term.

Figure IV shows graphical results. The figure shows a regression discontinuity plot with a linear fit and the corresponding 90% confidence interval. The y-axis represents the change in market leverage from the fiscal year before the index event to the 3rd fiscal year after the event. The x-axis is the distance from the respective index threshold. The greater the absolute value of the x-axis, the greater the distance of the stock from the cut-off. Dots on the right-hand side of the cutoff point represent stocks that have been added to indices, while dots on the left-hand side represent those that have not been included in an index. The dots can be interpreted as the average change in leverage for all observations in the same bin. The bin size is five. One can see that firms that have just been included in an index increase leverage by about 4% relative to those firms that have not been included in an index. Interestingly, if one goes farther away from the threshold, confidence intervals widen up. This is because the number of observations per bin decreases as there are few index events that affect a large number of stocks.

— Figure IV about here —

Table VI reports regression results of Equation (2). The dependent variable is the change in MARKET LEVERAGE over the time windows presented in the column titles. Following Lee and Lemieux (2010), we use different polynomials and bandwidths for robustness. A bandwidth of "all" refers to all affected treatment stocks, while "1/2" refers to half of the number of affected treatment stocks. Overall, the regression results confirm the findings from the difference-in-differences regressions. The results are robust to using different polynomials and bandwidths. With a magnitude of 1-3%, the coefficients for the treatment dummy even suggest a greater impact of equity index membershiop on leverage changes compared to the results based on the difference-in-differences estimator.

— Table VI about here —

To ensure that the findings from Table VI are not driven by changes in the covariates, we apply the regression discontinuity design to all control variables from Equation (2). Table VII reports the regression results for changes from year -1 to year 3, second degree polynomials, and a bandwidth that corresponds to all affected treatment stocks. The results confirm that leverage changes around the threshold are not driven by the control variables since we do not detect statistically significant changes in the covariates around the index events. Unreported regressions using other specifications concerning time windows, polynomials, and bandwidths yield the same conclusion.

— Table VII about here —

Next, we examine whether the results are driven by strategic behavior of index providers. For example, it could be that index creators are able to distinguish prospective "winner" from "loser" stocks in a certain country or industry and, accordingly, they will set the size of a new or modified index to reflect these expectations. Specifically, an index provider could expect that there will be high investor demand for the 10 largest industrial stocks from Germany (e.g., BMW, Siemens) and, therefore, the index provider will create a new index with these 10 firms. Thus, in other words, it could be that underlying unobserved trends explain our results and not index inclusion itself.

Even though the above analysis reveals that the parallel trends assumption is not violated and that the covariates are balanced across the treatment and control samples, we perform additional tests to rule out this alternative explanation. For this, we can exploit two aspects of the dataset. First, we restrict the dataset to index families. For example, some index providers create several related industry indices at the same time. When these indices all have the same size, it is less likely that index size definition is driven by expectations from a single industry.[14]. Furthermore, there are several indices in our dataset whose constituents are selected from the same universe and the same ranking methodology.[15] Second, in many cases, index providers choose round index sizes (e.g., 20, 30, 50, 100, etc.). When doing so, index providers will not always be able to perfectly distinguish stocks with good prospects from those with bad prospects. For example, there could also be strong demand for only 7 or even 13 large industrial stocks from Germany.

Therefore, we restrict the sample to these index categories. In addition, we also apply a smaller bandwidth of only one third so that we only look at a relatively small number of stocks around the inclusion threshold. The results can be found in Table VIII.[16] Even though the number of observations drops considerably, we still observe a positive and highly significant effect of *marginal* index inclusion on leverage in all models. Thus, we conclude that our main result does not stem from strategic index creation by index providers.

— Table VIII about here —

[14]Potential examples are, among others, the DJ Titans Const&Materials 30 Index, the DJ Titans Health Care 30 Index, the DJ Titans Oil&Gas 30 index, etc.

[15]For example, the CSI 300 Consumer Staples, the CSI 300 Energy index, and the CSI 300 Health Care index are, among others, all selected from the CSI 300 index.

[16]Difference-in-differences regressions yield similar results.

C. Additional robustness tests

In this section, we perform additional robustness tests. In addition to market leverage, we also run all regressions in this paper with book leverage as the dependent variable. The results can be found in Appendix B. The main result remains robust.

As a result of the ranking methodologies of many indices, which are oftentimes based on market capitalization or free float, firms that are included in an index are oftentimes larger than firms that are not included in the respective index. In addition, the normalized differences of profitability and tangibility in Table III are close to the rule of thumb as described by Imbens and Wooldridge (2009). Therefore, in addition to the regression discontinuity analysis, we also employ different calipers to the propensity score matching procedure to reduce potential matching biases (Cochran and Rubin, 1973). Following this approach, observations are only taken into account if the difference between propensity scores of treated and control firms is smaller than the caliper. A tight matching result which reduces more than 99% of potential matching biases (e.g., Cochran and Rubin, 1973) is shown in Appendix D. Overall, we are able to match 3,815 treated stocks that are added to an index to control stocks. After the matching, mean differences between treated and untreated stocks become very close to zero, and absolute values for the normalized differences are close to zero. Corresponding regression results are presented in Appendix E. Our findings regarding changes in market leverage remain the same. In unreported tests, we also apply a variety of different calipers and all results remain unchanged.

Moreover, we conduct placebo tests to examine the validity of the parallel trends assumption. Appendix F presents test results for the treatment and control firms from Table V. In contrast to before, however, we now look at different time windows around year -7 so that there is no overlap with the time window from the main analysis. For most time windows, there are no significant differences between treatment and control firms. The only statistically significant coefficient for TREATED X POST in Model 1 even exhibits a negative sign, which is opposite to our main findings. Overall, the results in Appendix F suggest a parallel trend of treatment and control firms before our main event time window.

Furthermore, our findings remain unchanged when we exclude the first type of events (launch), which includes most observations in the sample. Sub-sample tests excluding countries with the most observations (such as the U.S. or China) provide robust results as well. We also vary the number of control stocks per treatment stock (up to 5 control stocks per treated stock) and obtain very similar regression results. Our results are also robust to different industry classification methodologies (up to 4-digits of ICB). All results are available upon request.

D. Channel

In this section, we show that the changes in financial leverage are driven by changes in investor awareness and production of information. Unfortunately, one can only indirectly measure investor awareness. Following Chen et al. (2004), Irani and Oesch (2013) and Chen et al. (2015), we use two different variables to approximate investor awareness: The number of analyst following and stock liquidity costs. The first one signals the level of information production and monitoring by analysts. The later one is a result of market reactions to changes in information availability, e.g., reports generated by analysts. An increase in information availability reduces the cost of acquiring information, lowers adverse selection costs, increases familiarity to investors, and therefore, reduces liquidity costs.

Analysts

First, we apply the same difference-in-differences estimator, but employ the number of analysts following as the dependent variable, defined as the natural logarithm of the number of analysts following a stock. We find that the number of analysts who follow treatment stocks increases relative to control stocks after index inclusion. Compared to their control group, about 10% more analysts follow stocks that have exogenously been included in an index.[17] This result is consistent with the view that index inclusion increases investor attention and reduces adverse selection cost through greater analyst coverage, resulting in greater debt supply. This, in turn, results in increases in leverage.[18]

— Table IX about here —

Liquidity cost

Next, we look at a firm's liquidity cost. According to the information cost hypothesis by Shleifer (1986), Wooldrige and Ghosh (1986), and Edmister et al. (1996), index inclusion increases information availability, and, hence, reduces information acquiring costs. This further reduces adverse selection costs and, in turn, improves stock liquidity. In this regard, Hegde and McDermott (2003) and Chen et al. (2004) find that liquidity costs decrease after inclusion in the S&P 500 index and they argue that their findings are driven by increasing information availability and greater investor awareness.

If greater investor awareness reduced adverse selection costs, we would thus expect that firms may benefit from improved stock liquidity after exogenous index inclusion. Table X

[17]This result is also in line with Denis et al. (2003), Barber and Odean (2008), and Hirshleifer et al. (2009).

[18]In untabulated results, we also observe that the effect of index inclusion on leverage is stronger the more new analysts follow a firm around the index inclusion event.

presents difference-in-differences results for stock liquidity costs. The dependent variable, LIQUIDITY COSTS, is defined as the average daily relative bid-ask spread (bid-ask-spread divided by mid price) in a given fiscal year. Following literature about liquidity costs (e.g., Copeland and Galai, 1983; Stoll, 2000; Pastor and Stambaugh, 2003; Chordia et al., 2009), we include MARKET CAPITALIZATION, TRADING VOLUME, RETURN, and RETURN VOLATILITY as control variables. Variable definitions are summarized in Appendix A. Consistent with the notion that index membership increases investor awareness and reduces information costs (e.g., Wooldrige and Ghosh, 1986; Edmister et al., 1996; Chen et al., 2004), we find, relative to control stocks, lower bid-ask spreads once a firm is exogenously added to an index. For example, the table suggests that bid-ask spreads decrease by about 18 basis points in the year after the index inclusion (Model 1).

— Table X about here —

Public and private debt

If the increase in leverage is due to increasing debt supply caused by increasing investor awareness, one may expect that the change is primarily driven by increasing public debt supply because private debt suppliers such as banks have their own monitoring channels, and are not primary relying on analyst reports and public information. Hence, in Table XI, we further examine whether increases in leverage due to exogenous additions to stock indices can be attributed to increases in public or private debt. If increased investor attention caused higher leverage, we would expect that firms primarily increased their public debt ratio, while private debt would remain unchanged. For this, we perform separate difference-in-differences regressions for public and private debt ratios, respectively. Public debt is defined as the ratio of public debt to the market value of total assets, while private debt is the ratio of private debt to the market value of total assets. In line with our hypothesis, we find that, relative to control stocks, firms increase their public debt ratio around exogenous index inclusions, while the private debt ratio stays constant.[19]

— Table XI about here —

Bond liquidity

Next, we examine more directly why firms increase their public debt ratios. For this, we test whether the cost of public debt decreases following exogenous equity index membership. We rely on two sources for bond-related data. First, we search the Capital IQ database for all bonds that can be allocated to our sample firms. For the matching, we rely on firm-level identifiers (e.g., ISINs) as well as a final manual screening based on bond and firm names. In total, we identify more than 24,000 bonds for which we obtain information on their notional values from Capital IQ. Furthermore, we also calculate equal-weighted coupon rates and average coupon rates based on the notional values of the outstanding bonds.

Second, for the 24,000 bonds, we download daily closing prices from Bloomberg. Using these data, we calculate four liquidity measures:

1. **Roll**: Roll (1984) approximates the bid-ask spread based on $2\sqrt{-cov(R_t, R_{t-1})}$, where R_t and R_{t-1} denote daily consecutive returns. The measure is missing if the covariance is positive (Dick-Nielsen et al., 2012). The measure is calculated daily for rolling 21 trading day windows. Annual values are then based on the median observation for a given financial year.

[19]In untabulated regression, we also find that the result also holds when one deflates public debt by total debt and not the market value of assets.

2. **Roll_Zero**: Following Schestag et al. (2016), we alternatively calculate the Roll (1984) measure where we set positive covariances to zero.

3. **FHT**: Proxy for bid-ask spreads, as defined by Fong et al. (2016). Calculated as $2\sigma N^{-1}(\frac{1+Zero\_Ret}{2})$. σ is a bonds standard deviation of daily returns in a financial year and N^{-1} is the inverse function of the cumulative normal distribution.

4. **Zero_Ret**: Fraction of zero returns relative to the number of trading days in a financial year, as defined by Schestag et al. (2016).

The results are provided in Table XII. In the first two models of the table, which is based on firm-year observations, we observe that firms which are exogenously added to an index experience a decrease in their average coupons by about 0.13% relative to the control group, which corresponds to about 2.1% of the average coupon payment (6.05%).

Models 3 to 6 are based on bond-year level observations. When performing the matching of treatment bonds to control bonds, we also match along the coupon rate and the notional amount. All models also include bond fixed effects. In the model, we observe that, relative to control stocks, both Roll (1984) measures, the FHT measure and the fraction of zero returns (Zero_Ret) decrease by about 25% for the treatment bonds. The result is consistent with the view that equity index membership improves bond liquidity, resulting in lower cost of public debt, which improves, in turn, a firm's access to debt.[20]

— Table XII about here —

[20]The result is also broadly consistent with Dannhauser (2016).

International variation

In this section, we examine whether institutional differences moderate the effect of index membership on capital structure. We expect that the better the information environment in a country, the less pronounced the effect of equity index membership on capital structure will be. Stronger disclosure requirements and better accounting standards reduce public bond investors' information acquisition cost, resulting in lower adverse selection cost and, hence, enabling firms to borrow more. Therefore, information production through equity index membership will be less important. In addition, we conjecture that more developed stock markets strengthen the effect of equity index membership on debt levels. Investor awareness will be higher in more developed capital markets, resulting in greater production of information that is also available to debt investors, amplifying the consequences of equity index membership. Empirically, we look at a country's disclosure requirements (La Porta et al., 2006), the quality of accounting statements (La Porta et al., 1998), and the size of its stock market. In all models, we control for two classical measures of investor protection, namely the protection of minority shareholders (La Porta et al., 2008) and the protection of creditors (Djankov et al., 2007). All definitions can be found in Appendix A.

Table XIII presents the regression results. In Models 1 and 2, we observe that firms increase leverage less when the information environment in a country is better, as suggested by the negative and significant coefficients for the three-way interactions based on DISCLOSURE and ACCOUNTING. We also find that in more developed stock markets, possible due to greater investor awareness, firms increase leverage more after they are added to an index. Finally, we do not observe that the index membership effect is moderated by the protection of minority investors (ADRI) and creditors (CR). Overall, the result is consistent with the view that the index effect is less (more) pronounced in countries with better information availability (more developed equity markets). The findings suggest that index additions reduce the cost of financing and increase the supply of capital.

— Table XIII about here —

E. Stock deletions

Due to a low number of observations, only limited causal inference can be drawn from tests based on stocks that are exogenously deleted from an index. Nevertheless, Table XIV presents difference-in-differences regression results for stock deletions based on Equation (1). As described in Section III, treatment firms are matched to comparable control stocks from the same country, year, and industry, and, in addition, matched based on a propensity score using firm size, profitability, tangibility, and the market-to-book ratio. Most regression results for stocks deleted from an index or included in a discontinued index are statistically not different from zero although all difference-in-differences coefficients exhibit the expected negative sign.

This asymmetric result is consistent with existing literature about equity index effects on stock prices, trading volumes, and liquidity costs (e.g., Harris and Gurel, 1986; Hegde and McDermott, 2003; Chen et al., 2004). This literature does not find significant or weak index effects for index deletions. For example, Chen et al. (2004) argue that asymmetric index effects stem from investor awareness, i.e., one would not become suddenly “unaware” about certain stocks just because they are deleted from an index. Therefore, one can only find, if any, weak index effects on stocks that are deleted from equity indices.

— Table XIV about here —

V. Conclusion

In this paper, we examine the effects of index membership on debt policy. Thereby, we shed light on spillover effects of equity markets on debt markets. Specifically, we argue that exogenous addition to an index expands a firm's investor base because improved monitoring by analysts and institutional shareholders increases production of information, which is also available to potential investors in a firm's debt securities. This lowers the cost of debt and lets firm borrow more, resulting in higher leverage.

For identification, we rely on exogenous shocks to equity index membership as a result of the formation of new equity indices or discontinuation of an existing index, increases or decreases in the number of index constituents, or changes in index selection criteria. The intuition behind this approach is that, in contrast to regular index updates, firms cannot influence index membership, in particular because of the suddenness of the events.[21] To identify exogenous shocks in index membership, we manually screen more than 54,000 press releases related to 7,356 equity indices from 32 major index providers across 21 countries. Thereby, we arrive at more than 200 exogenous index events from January 1996 to June 2014 that are unrelated to firm characteristics. These index events affect about 8,000 (treatment) stocks.

Based on a difference-in-differences estimator, we find that exogenous addition to an index results in an increase in leverage by about two percentage points. The results are robust to several empirical specifications such as placebo tests and to applying a regression discontinuity design. Furthermore, we rule out that the results are driven by strategic behavior of index providers. Index providers may have an incentive to create or change

[21]For example, in our dataset, index changes, formations, or discontinuations are announced on average 44 days (median: 23 days) before the index event, while the exact stocks that are affected by the event are announced only 25 days later (median: 1 day).

indices so that they include “winner” stocks and exclude “loser” stocks. Therefore, we restrict the dataset to index families whose indices all have the same number of constituents and index families whose constituents are selected from the same universe of stocks and the same ranking methodology. In addition, we restrict the dataset to indices with a round number of index constituents (e.g., 20, 30, 50, 100, etc.) and only look at a small number of stocks around the index inclusion threshold. In these cases, index providers will not always be able to perfectly distinguish stocks with good prospects from those with bad prospects. Even though the number of observations drops considerably, we still observe a positive and highly significant effect of index inclusion on leverage.

We also shed light on the underlying mechanisms. Around the exogenous addition to an index, we find that the number of analysts following a firm increases relative to control stocks, which is consistent with the notion that index membership increases investor awareness and reduces information costs. We also observe that increases in leverage around the index events mainly stem from increases in the public debt ratio and not in the private debt ratio. This is in line with greater access to public debt as a result of lower monitoring cost for public investors who generally face higher monitoring costs than private lenders. Furthermore, relative to control stocks, borrowing costs in public debt markets decrease, while bond liquidity increases. Finally, we exploit the internationality of the dataset to show that the effect is less pronounced in countries with stronger disclosure requirements. Overall, the findings suggest that index additions reduce the cost of financing and increase the supply of capital. Furthermore, the results suggest that the institutional environment affects corporate financing decisions.

This study has three important implications. First, the study shows that equity markets influence public debt markets. Second, it highlights the importance of equity index membership on debt financing. Firms may want to pursue active policies to become member of equity indexes when they want to increase their financial leverage. Third, better access to debt as a result of index membership may provide firms with a competitive advantage. In this regard, firms that have been sufficiently successful to be included in an index, may be awarded additional benefits through their index membership, thereby leaving less successful firms even more behind. This is particularly relevant in times of ever more important ETF markets. For example, global ETF markets experienced steady growth in the last decade, and their total assets under management arrived at almost 3tn USD in 2015.[22] Against this background, regulators should critically examine the role of indices that goes well beyond the "pure" relevance for investors.

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[22]Source: ETF Annual Review & Outlook, 21 January 2016, Deutsche Bank Market Research.

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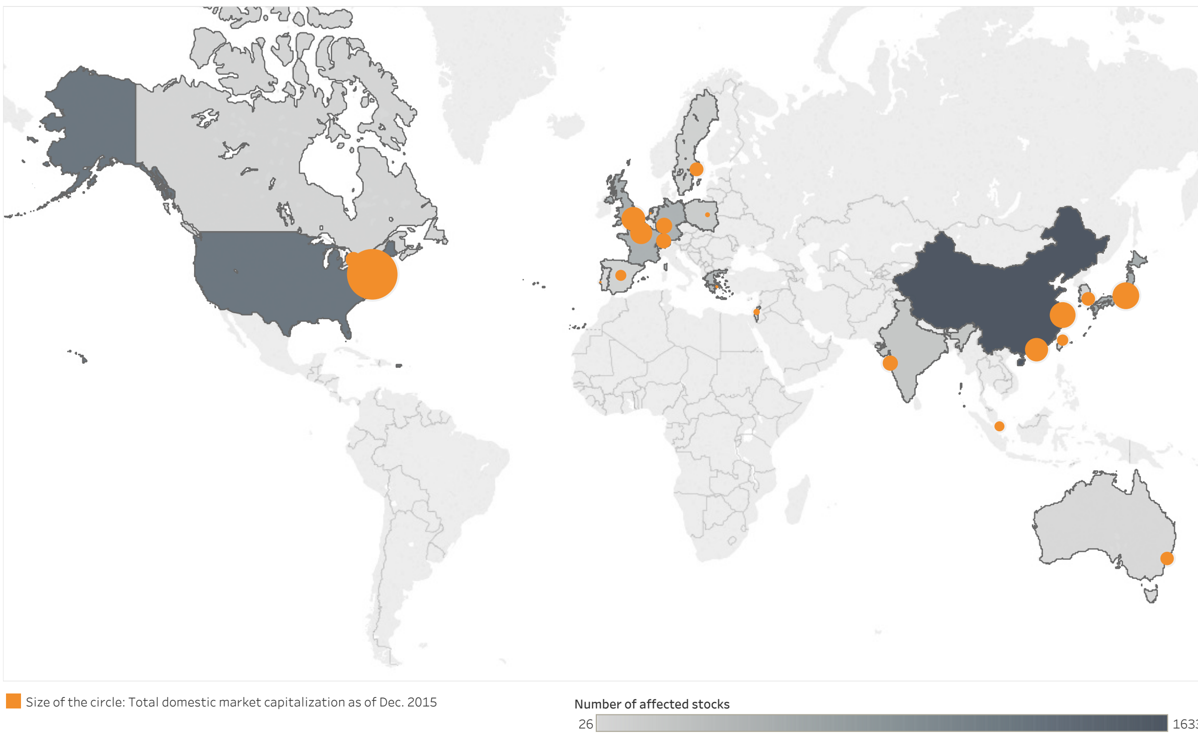

Figure I. International stock exchange coverage and number of affected stocks per country.

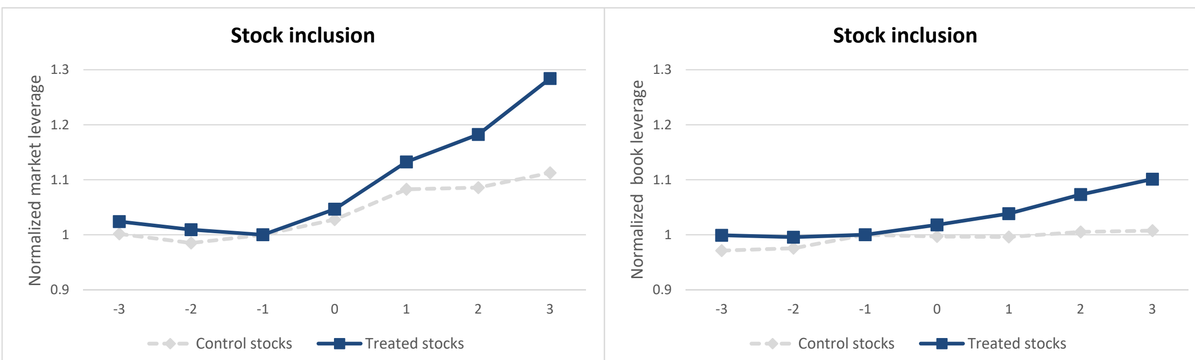

Figure II. Development of mean financial leverage around exogenous index events. Index inclusion is during $t = 0$. Values are normalized relative to the value in the year before the event.

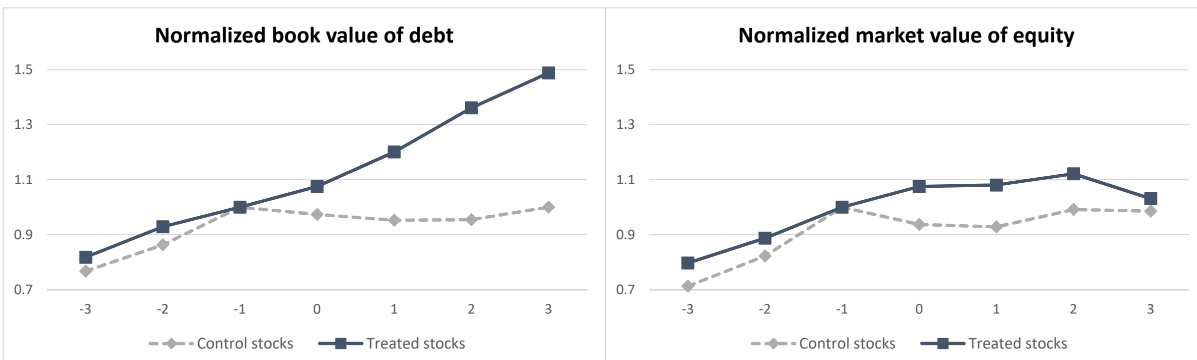

Figure III. Development of median normalized debt and equity values around exogenous index events. Index inclusion is during $t = 0$. Values are normalized relative to the value in the year before the event.

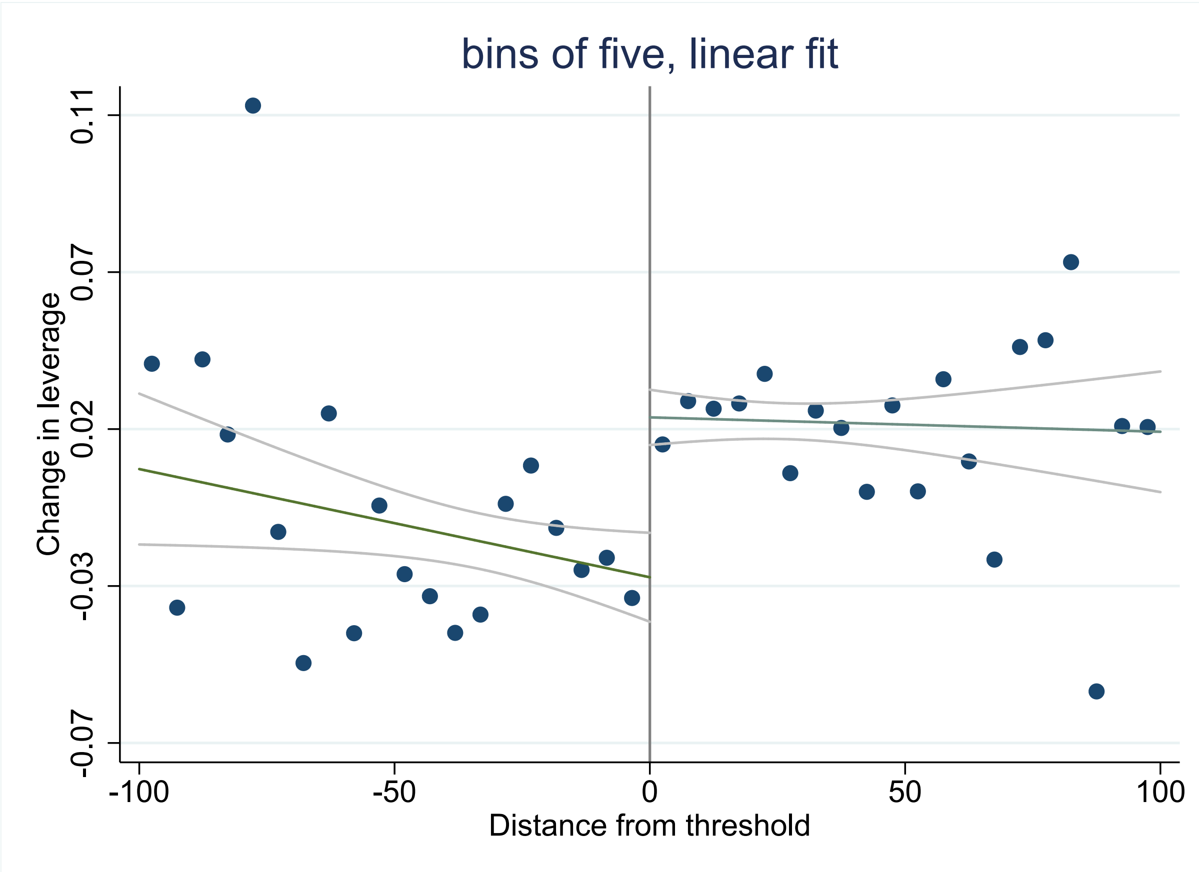

Figure IV. The figure shows a regression discontinuity plot with linear fit and the corresponding 90% confidence interval. The bin width is five. The x-axis displays the distance from the respective index thresholds. Positive (negative) values refer to firms that are (not) included in an index. The y-axis shows the mean market leverage change from one year before the event to three years after the event.

Table I
Overview of exogenous equity index events

The table shows all identified exogenous equity index events from 21 countries from January 1996 to June 2014. The last two columns exhibit the number of stocks affected by an index event. Launch/closure refers to the introduction of a new equity index or closing of an existing index. Index universe change refers to a change in the eligible index universe, such as country and industry. Number change captures events based on an increase or decrease in the number of index constituents. Ranking methodology change considers the change of index selection criteria and change of criteria weightings. Index events are identified via screening of press releases (including archived press releases) from major index providers. Only events with available constituents details are included in the sample. Index constituent lists are collected from index providers and external data vendors such as Datastream, Bloomberg, and newswires.

Event type	**Number of events** (1)	**Number of stock inclusions** (2)	**Number of stock deletions** (3)
Launch/closure	168	7,534	503
Index universe change	22	132	51
Number change	19	452	207
Ranking methodology change	17	31	40
Total	**226**	**8,149**	**801**

Table II
Country distribution of event stocks

The table shows the country distribution of stocks affected by exogenous index events from 21 countries from January 1996 to June 2014.

Country	**Number of stock inclusions**	**Number of stock deletions**	**Total number of stocks**
Australia	44	13	57
Canada	82	20	102
China	1,633		1,633
France	543	66	609
Germany	439	162	601
Greece	448	66	514
Hong Kong	1,060	13	1,073
India	211		211
Israel	174	27	201
Japan	590	97	687
Netherlands	55	7	62
Poland	229		229
Portugal	20	6	26
Singapore	393	27	420
South Korea	131		131
Spain	122	15	137
Sweden	87	69	156
Switzerland	94	13	107
Taiwan	120	2	122
United Kingdom	633	22	655
United States	1,041	176	1,217
Total	**8,149**	**801**	**8,950**

Table III: Propensity score matching

The table reports descriptive statistics for 6,463 non-financial stocks exogenously added to an index and their nearest neighbor control stocks before and after propensity score matching. The control stocks are from the same country, year, and industry as the treated stocks, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. The matching basis for control stocks are all stocks in the Worldscope country lists excluding the stocks in the treatment group. The MEAN of treated and (unmatched and matched) control stocks, the mean DIFFERENCE between treated and control stocks, and the normalized difference in coefficients according to Imbens and Wooldridge (2009) are presented in the table. Normalized differences not exceeding a quarter are considered to be not significantly different from zero.

	Before matching				After matching			
Variable	Mean (treated)	Mean (unmatched control)	Difference	Normalized difference	Mean (treated)	Mean (matched control)	Difference	Normalized difference
Size	14.14	11.71	2.43	0.31	14.14	13.57	0.57	0.12
Profitability	0.12	0.02	0.10	1.29	0.12	0.11	0.01	0.23
Tangibility	0.31	0.29	0.03	0.24	0.31	0.28	0.03	0.20
Market-to-book ratio	3.31	3.20	0.11	0.00	3.31	3.35	-0.04	-0.01

Table IV
Descriptive statistics RDD

This table reports descriptive statistics for firms used for the regression discontinuity sample. The sample consists of stocks near the threshold that have *just* been included or not included in an index. Only firms ranked within the full bandwidth around the threshold are considered. The full bandwidth is defined as the number of affected stocks per index event, i.e., if an index with a size of 30 is created, 60 stocks will be considered. The number of observations (N), mean, standard deviation (SD), 25%-percentile, median, and 75%-percentile are presented for the market leverage, book leverage, natural logarithm of the dollar value of total assets (size), profitability, tangibility, and the market-to-book ratio.

Variable	N	Mean	SD	25%-percentile	Median	75%-percentile
Market leverage	6,675	0.23	0.22	0.04	0.16	0.36
Book leverage	6,674	0.32	0.24	0.10	0.31	0.50
Size	6,675	13.28	2.00	12.06	13.24	14.53
Profitability	6,483	0.10	0.14	0.06	0.10	0.16
Tangibility	6,636	0.29	0.23	0.10	0.24	0.44
Market-to-book ratio	6,673	3.31	3.97	1.19	2.08	3.76

Table V: Market leverage: Difference-in-differences regressions for stocks exogenously added to an index

The table reports coefficients from difference-in-differences regressions. MARKET LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for stocks added to an index, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5	6	7	8
Window (years)	[-1,1]	[-2,2]	[-3,3]	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: Market leverage								
Treated x Post	**0.0133*** **	**0.0195*** **	**0.0230*** **	**0.0108** **	**0.0151*** **	**0.0172*** **	**0.0191*** **	**0.0264*** **
	(0.00449)	**(0.00542)**	**(0.00683)**	**(0.00421)**	**(0.00486)**	**(0.00606)**	**(0.00548)**	**(0.00714)**
Post	-0.00182	-0.00406	-0.00991*	-0.00343	-0.00454	-0.00968**	0.000479	-0.0140**
	(0.00425)	(0.00403)	(0.00513)	(0.00405)	(0.00366)	(0.00460)	(0.00440)	(0.00701)
Size				0.0660***	0.0715***	0.0768***	0.0742***	0.0845***
				(0.00687)	(0.00513)	(0.00476)	(0.00662)	(0.00753)
Profitability				-0.207***	-0.236***	-0.261***	-0.318***	-0.314***
				(0.0283)	(0.0234)	(0.0234)	(0.0261)	(0.0423)
Tangibility				0.105***	0.135***	0.152***	0.114***	0.116***
				(0.0232)	(0.0230)	(0.0223)	(0.0263)	(0.0271)
Market-to-book ratio				-0.0029**	-0.0028***	-0.0033***	-0.0030***	-0.0036***
				(0.00121)	(0.000740)	(0.000602)	(0.000940)	(0.00107)
Observations	22,460	38,433	51,439	22,460	38,433	51,439	19,510	16,161
Adjusted R^2	0.902	0.869	0.823	0.910	0.881	0.843	0.898	0.873
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table VI: Market leverage: Regression discontinuity design for stock inclusions

The table reports regression coefficients based on a regression discontinuity design for stock inclusions. The dependent variable is the change in MARKET LEVERAGE over the time windows presented in the column titles. A bandwidth of "all" refers to the number of affected treatment stocks, while "1/2" refers to half of the number of affected treatment stocks. TREATED is a dummy variable set to one for stocks added to an index, and zero otherwise. Control variables are based on first differences for the time windows presented in the column titles. Robust standard errors are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	2a	2b	3a	3b
Window (years)	1 vs. -1	2 vs. -1	3 vs. -1	2 vs. -1	2 vs. -1	3 vs. -1	3 vs. -1
Polynomial	One	One	One	Four	Two	Four	Two
Bandwidth	All	All	All	All	1/2	All	1/2
Dep. variable: Change in market leverage							
Treated	**0.0122****	**0.0222*****	**0.0285*****	**0.0254****	**0.0295****	**0.0249***	**0.0287****
	(0.00582)	**(0.00694)**	**(0.00822)**	**(0.0125)**	**(0.0120)**	**(0.0152)**	**(0.0143)**
Change in size	0.0957***	0.104***	0.101***	0.104***	0.117***	0.101***	0.122***
	(0.00786)	(0.00765)	(0.00757)	(0.00765)	(0.0109)	(0.00758)	(0.0109)
Change in profitability	-0.291***	-0.364***	-0.357***	-0.364***	-0.328***	-0.357***	-0.332***
	(0.0287)	(0.0335)	(0.0348)	(0.0335)	(0.0444)	(0.0349)	(0.0435)
Change in tangibility	0.190***	0.188***	0.245***	0.188***	0.104***	0.246***	0.209***
	(0.0324)	(0.0294)	(0.0304)	(0.0295)	(0.0363)	(0.0304)	(0.0385)
Change in	-0.00385***	-0.00223**	-0.00355***	-0.00228**	-0.00137	-0.00354***	-0.00145
market-to-book ratio	(0.00118)	(0.00103)	(0.00119)	(0.00104)	(0.00146)	(0.00119)	(0.00154)
Observations	4,340	3,806	3,615	3,806	2,267	3,615	2,147
Adjusted R^2	0.346	0.401	0.361	0.400	0.400	0.360	0.381
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table VII
RDD robustness: Covariates around the threshold

The table reports regression coefficients based on a regression discontinuity design for stock inclusions. The dependent variables are the control variables from Table VI. A bandwidth of "all" refers to the number of affected treatment stocks. TREATED is a dummy variable set to one for stocks added to an index, and zero otherwise. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively.

Window (years)	3 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1
Polynomial	Two	Two	Two	Two
Bandwidth	All	All	All	All
Dep. variable:	Change in SIZE	Change in PROFITABILITY	Change in TANGIBILITY	Change in MARKET-TO-BOOK
Treated	**0.00474**	**-0.00260**	**0.00982**	**0.19283**
	(0.0375)	**(0.01035)**	**(0.00817)**	**(0.25267)**
Observations	3,724	3,616	3,718	3,724
Adjusted R^2	0.171	0.208	0.126	0.224
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes

Table VIII: RDD robustness: Index threshold manipulation

The table reports regression coefficients based on a regression discontinuity design for stock inclusions. The dependent variable is the change in MARKET LEVERAGE over the time windows presented in the column titles. A bandwidth of "1/2" refers to half the number of affected treatment stocks, while "1/3" refers to one third of the number of affected treatment stocks. TREATED is a dummy variable set to one for stocks added to an index, and zero otherwise. Control variables are based on first differences for the time windows presented in the column titles. Robust standard errors are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1a	1b	2a	2b	3a	3b	4a	4b
Window (years)	2 vs. -1	2 vs. -1	2 vs. -1	2 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1
Polynomial	One	One	Two	Two	One	One	Two	Two
Bandwidth	1/2	1/3	1/2	1/3	1/2	1/3	1/2	1/3
Dep. variable: Change in market leverage								
Treated	**0.0284****	**0.0379*****	**0.0313****	**0.0394****	**0.0274*****	**0.0405*****	**0.0295****	**0.0342****
	(0.0121)	**(0.0146)**	**(0.0145)**	**(0.0190)**	**(0.00980)**	**(0.0140)**	**(0.0123)**	**(0.0169)**
Change in size	0.119***	0.118***	0.119***	0.118***	0.104***	0.131***	0.104***	0.132***
	(0.0124)	(0.0157)	(0.0124)	(0.0156)	(0.00961)	(0.0130)	(0.00963)	(0.0130)
Change in profitability	-0.417***	-0.465***	-0.417***	-0.469***	-0.378***	-0.385***	-0.377***	-0.389***
	(0.0720)	(0.0945)	(0.0712)	(0.0933)	(0.0473)	(0.0600)	(0.0472)	(0.0597)
Change in tangibility	0.0915**	0.0400	0.0905**	0.0366	0.243***	0.212***	0.243***	0.210***
	(0.0433)	(0.0443)	(0.0431)	(0.0444)	(0.0387)	(0.0463)	(0.0387)	(0.0459)
Change in	-0.00283	-0.00322	-0.00290	-0.00339	-0.0055***	-0.00415**	-0.0054***	-0.00416**
market-to-book ratio	(0.00219)	(0.00226)	(0.00217)	(0.00226)	(0.00158)	(0.00208)	(0.00158)	(0.00207)
Observations	1,531	980	1,531	980	2,597	1,480	2,597	1,480
Adjusted R^2	0.435	0.494	0.435	0.494	0.354	0.406	0.354	0.406
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes	yes	yes
Year x Country FE	yes	yes	yes	yes	yes	yes	yes	yes
Year x Industry FE	yes	yes	yes	yes	yes	yes	yes	yes

Table IX
Analyst following: Difference-in-differences regressions for stocks exogenously added to an index

The table reports coefficients from difference-in-differences regressions. The dependent variable is ANALYSTS, defined as the natural logarithm of the number of analysts following a stock, collected from the I/B/E/S database. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: Analysts					
Treated x Post	**0.0723*** **	**0.107*** **	**0.137*** **	**0.0999*** **	**0.0621**
	(0.0261)	**(0.0270)**	**(0.0308)**	**(0.0342)**	**(0.0393)**
Post	-0.0550**	-0.0500**	-0.103***	-0.0556*	0.00142
	(0.0249)	(0.0227)	(0.0248)	(0.0289)	(0.0339)
Size	0.356***	0.384***	0.398***	0.372***	0.389***
	(0.0357)	(0.0270)	(0.0229)	(0.0355)	(0.0377)
Profitability	0.746***	0.701***	0.617***	0.943***	1.111***
	(0.155)	(0.110)	(0.102)	(0.167)	(0.184)
Tangibility	0.224	0.239**	0.179*	0.199	0.127
	(0.138)	(0.108)	(0.0957)	(0.146)	(0.149)
Market-to-book ratio	0.00423	0.0106**	0.0159***	0.0136**	0.0168***
	(0.00575)	(0.00486)	(0.00383)	(0.00591)	(0.00613)
Observations	15,594	27,298	36,232	13,818	11,434
Adjusted R^2	0.895	0.872	0.852	0.881	0.874
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes

Table X
Liquidity costs: Difference-in-differences regressions for stocks exogenously added to an index

The table reports coefficients from difference-in-differences regressions. The dependent variable is LIQUIDITY COSTS, defined as the natural logarithm of the average relative bid-ask spreads in basis points in a fiscal year. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm years after a change in index membership. MARKET CAPITALIZATION is defined as the natural logarithm of market capitalization in million USD at fiscal year end. TRADING VOLUME is defined as the natural logarithm of the total number of shares traded in the fiscal year. RETURN is defined as the cumulative stock return in basis points in the fiscal year. RETURN VOLATILITY is defined as the standard deviation of monthly returns in the fiscal year, in basis points. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: Liquidity costs					
Treated x Post	**-0.0450*** **	**-0.0477*** **	**-0.0509** **	**-0.0603*** **	**-0.0512** **
	(0.0163)	**(0.0178)**	**(0.0224)**	**(0.0193)**	**(0.0228)**
Post	0.0435***	0.0374***	0.0499***	0.0421***	0.0604***
	(0.0133)	(0.0125)	(0.0147)	(0.0143)	(0.0174)
Market capitalization	-0.315***	-0.323***	-0.318***	-0.341***	-0.350***
	(0.0173)	(0.0167)	(0.0179)	(0.0181)	(0.0210)
Trading volume	-0.225***	-0.218***	-0.218***	-0.212***	-0.214***
	(0.0127)	(0.0108)	(0.0125)	(0.0147)	(0.0179)
Return	0.187***	0.175***	0.160***	0.216***	0.218***
	(0.0182)	(0.0135)	(0.0135)	(0.0178)	(0.0213)
Return volatility	0.973***	1.275***	0.923***	1.080***	0.814***
	(0.181)	(0.121)	(0.132)	(0.149)	(0.234)
Observations	17,978	31,330	42,338	15,750	13,061
Adjusted R^2	0.966	0.959	0.950	0.966	0.967
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes

Table XI
Debt structure: Difference-in-differences regressions for stocks exogenously added to an index

The table reports coefficients from difference-in-differences regressions. PUBLIC DEBT LEVERAGE and PRIVATE DEBT LEVERAGE are the dependent variables, defined as the ratios of public debt or private debt to the market value of total assets. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5	6
Window (years)	[-1,1]	[-2,2]	[-3,3]	[-1,1]	[-2,2]	[-3,3]
Dep. variable:	Public debt ratio			Private debt ratio		
Treated x Post	**0.0140***** **(0.00415)**	**0.0125***** **(0.00458)**	**0.00973**** **(0.00485)**	**-0.00275** **(0.00636)**	**0.00279** **(0.00592)**	**0.00125** **(0.00716)**
Post	-0.008*** (0.00295)	-0.010*** (0.00344)	-0.00731* (0.00384)	9.01e-05 (0.00508)	0.00169 (0.00458)	-0.00112 (0.00531)
Observations	21,277	39,105	56,260	21,277	39,105	56,260
Adjusted R^2	0.813	0.764	0.744	0.864	0.828	0.798
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table XII
Public debt financing

The table reports coefficients from difference-in-differences regressions. The dependent variables, provided in the column titles, are different measures of coupon rates and bond liquidity. See Section IV for more information. Models 1 and 2 are based on firm-year observations, while all other models are at the bond-year level. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks (bonds) are experiencing exogenous index inclusion, while control stocks (bonds) did not experience an index change but have similar firm characteristics. Control stocks (bonds) are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. For the bond-level sample, we also match along coupon rates and the notional amounts. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5	6
Window (years)			[-3,3]			
Dep. variable:	Coupon	Coupon (weighted)	Roll	Roll_Zero	FHT	Zero_Ret
Treated x Post	**-0.137*****	**-0.134****	**-0.0475****	**-0.0462****	**-0.0710****	**-0.0423****
	(0.0520)	**(0.0563)**	**(0.0211)**	**(0.0185)**	**(0.0340)**	**(0.0193)**
Post	0.126**	0.153***	0.0802	0.0326	0.0135	-0.000222
	(0.0497)	(0.0575)	(0.0549)	(0.0422)	(0.0891)	(0.0438)
Size	-0.0966	-0.114	0.0159*	0.0222**	0.00930	0.00303
	(0.0621)	(0.0695)	(0.00872)	(0.00991)	(0.00876)	(0.00472)
Profitability	0.258	0.325	-0.0572	-0.0563*	-0.0456	-0.0634
	(0.270)	(0.289)	(0.0539)	(0.0341)	(0.0930)	(0.0700)
Tangibility	-0.494	-0.578*	0.0822***	0.0620**	0.107***	0.0157
	(0.324)	(0.341)	(0.0260)	(0.0291)	(0.0403)	(0.0188)
Market-to-book ratio	-0.0152*	-0.0142	0.00127**	0.00136*	0.000686	0.000247
	(0.00871)	(0.00934)	(0.000608)	(0.000705)	(0.000678)	(0.000397)
Book leverage	0.380*	0.428*	-0.0553	-0.0273	-0.114	-0.101**
	(0.222)	(0.231)	(0.0421)	(0.0261)	(0.0724)	(0.0509)
Bonds Outstanding	-0.232***	-0.290***				
	(0.0625)	(0.0683)				
Observations	4,677	4,677	30,408	31,590	34,338	52,861
Adjusted R^2	0.630	0.623	0.120	0.091	0.100	0.100
Firm FE	yes	yes	no	no	no	no
Bond FE	no	no	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Year x Country FE	yes	yes	yes	yes	yes	yes
Year x Industry FE	yes	yes	yes	yes	yes	yes

Table XIII
Market leverage: International variation in the index effect

The table reports coefficients from difference-in-differences regressions. MARKET LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by country are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5	6
Window (years)			[-2,2]			
Dep. variable:			Market leverage			
Treated x Post	0.0704**	0.245***	0.00502	0.0472	0.168***	5.95e-05
	(0.0246)	(0.0367)	(0.0140)	(0.0351)	(0.0488)	(0.0125)
Post	-0.0352	-0.230***	-0.0103	-0.0388	-0.174***	-0.0119
	(0.0241)	(0.0498)	(0.0147)	(0.0273)	(0.0537)	(0.0136)
Post x Disclosure	0.0142			0.0229		
	(0.0239)			(0.0344)		
Treated x Post x Disclosure	**-0.0654*** **			**-0.0490***		
	(0.0159)			**(0.0232)**		
Post x Accounting		0.00389***			0.00324**	
		(0.00107)			(0.00113)	
Treated x Post x Accounting		**-0.0039*** **			**-0.0029*** **	
		(0.000774)			**(0.000826)**	
Post x CR			0.0113*			0.00908
			(0.00593)			(0.00594)
Treated x Post x CR			**-0.00760**			**-0.00630**
			(0.00649)			**(0.00598)**
Post x ADRI	0.00276	-0.00275	-0.00568*	0.00303	-0.00560	-0.00428
	(0.00721)	(0.00516)	(0.00298)	(0.00596)	(0.00717)	(0.00321)
Treated x Post x ADRI	**-0.00248**	**0.00146**	**0.00520***	**-0.00147**	**0.00291**	**0.00548***
	(0.00704)	**(0.00625)**	**(0.00287)**	**(0.00648)**	**(0.00677)**	**(0.00282)**
Market Cap to GDP	-0.000212	-0.0611***	-0.00376	-0.00587	-0.0621***	-0.00656
	(0.00455)	(0.0201)	(0.00893)	(0.00585)	(0.0180)	(0.00636)
Treated x Market Cap to GDP	-0.00152	-0.00926	0.00315	0.00219	-0.00210	0.00389
	(0.00292)	(0.0129)	(0.00455)	(0.00299)	(0.0123)	(0.00287)
Post x Market Cap to GDP	0.00143	-0.0342*	-0.000551	-0.00148	-0.0347**	-0.00249
	(0.00118)	(0.0171)	(0.00206)	(0.00149)	(0.0159)	(0.00161)
Treated x Post x Market Cap to GDP	**0.00484*** **	**0.0292***	**0.00404***	**0.00656*** **	**0.0283***	**0.00516*** **
	(0.00156)	**(0.0126)**	**(0.00213)**	**(0.00130)**	**(0.0103)**	**(0.00179)**
Observations	26,880	21,670	36,928	26,864	21,654	36,912
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	No	No	No	Yes	Yes	Yes

Table XIV
Market leverage: Difference-in-differences regressions for stocks exogenously deleted from an index

The table reports coefficients from difference-in-differences regressions. MARKET LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index deletion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: market leverage					
Treated x Post	**-0.00505**	**-0.00195**	**-0.00435**	**-0.00883**	**-0.0234***
	(0.00790)	**(0.00839)**	**(0.00951)**	**(0.00948)**	**(0.0125)**
Post	-0.0143	-0.0101	0.0187	0.0153	0.00165
	(0.0194)	(0.0204)	(0.0182)	(0.0392)	(0.0595)
Size	0.0860***	0.0810***	0.0705***	0.0793***	0.0695***
	(0.0252)	(0.0185)	(0.0112)	(0.0206)	(0.0223)
Profitability	0.0223	-0.120**	-0.210***	-0.418***	-0.357***
	(0.0941)	(0.0477)	(0.0321)	(0.0645)	(0.0917)
Tangibility	0.213**	0.124***	0.225***	0.117*	0.0101
	(0.0858)	(0.0481)	(0.0542)	(0.0664)	(0.0894)
Market-to-book ratio	-0.000438	-0.00208	-0.00210	-0.00240	-0.00687*
	(0.00185)	(0.00156)	(0.00146)	(0.00178)	(0.00410)
Observations	2,349	4,316	6,531	2,177	2,019
Adjusted R^2	0.949	0.924	0.896	0.935	0.915
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes

Appendix A: **Definition of variables**

Variable	Description
Main variables	
Market leverage	Total debt [WC03255] / (total debt [WC03255] + market value of common equity [WC08001]). Source: Worldscope.
Book leverage	Total debt [WC03255] / (total debt [WC03255] + book value of common equity [WC03501]). Source: Worldscope.
Analyst	Natural logarithm of the total number of estimates for earning per share ending in next fiscal year end. Source: I/B/E/S.
Liquidity costs	Average relative bid-ask spread (bid-ask spread / mid-price) in a fiscal year. Source: Datastream.
Public debt ratio	(Senior bonds and notes + subordinated bonds and notes) / market value of total assets. Source: Capital IQ.
Private debt ratio	(Term loans + capital lease + revolving credit + commercial paper + other borrowings) / market value of total assets. Source: Capital IQ.
Coupon	Average coupon for all bonds outstanding in percent. Source: Capital IQ.
Roll, Roll_Zero, FHT, Zero_Ret	Various measures of bond liquidity. See Section IV for more information. Source: Bloomberg.
Control variables	
Size	Natural logarithm of total assets [WC02999] in USD. Source: Worldscope.
Profitability	Earnings before interest, taxes, depreciations, and amortizations (EBITDA) [WC18198] / total assets [WC02999]. Source: Worldscope.
Tangibility	Property, plant and equipment [WC02501] / total assets [WC02999]. Source: Worldscope.
Market-to-book ratio	Market value of common equity [WC08001] / book value of common equity [WC03501]. Source: Worldscope.
Market capitalization	Natural logarithm of market capitalization in USD. Source: Datastream.
Trading volume	Natural logarithm of the total number of shares traded in a fiscal year. Source: Datastream.
Return	Cumulative stock return in the fiscal year. Source: Datastream.
Return volatility	Standard deviation of monthly returns in a fiscal year. Source: Datastream.
Bonds outstanding	Natural logarithm of the amount of bonds outstanding in USD. Source: Capital IQ.
Other variables	
Industry classification	Industry Classification Benchmark (ICB) supersector (2-digits). Source: Datastream.
Disclosure	Disclosure requirements index, as defined by La Porta et al. (2008). Higher values imply better company disclosure.
Accounting	Quality of accounting standards, as defined by La Porta et al. (1998). Higher values imply better accounting standards.
ADRI	Antidirector rights index, as defined by La Porta et al. (2008). Higher values imply better protection of minority shareholders.
Market Cap to GDP	Market capitalization of listed domestic companies deflated by a country's GDP. Source: The World Bank.
CR	Creditor rights index, as defined by Djankov et al. (2007). Higher values imply better creditor protection.

Appendix B
Book leverage: Difference-in-differences regressions for stocks exogenously added to an index

The table reports coefficients from difference-in-differences regressions. BOOK LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: book leverage					
Treated x Post	**0.0141*** **	**0.0141*** **	**0.0186*** **	**0.0164*** **	**0.0210*** **
	(0.00387)	**(0.00441)**	**(0.00544)**	**(0.00515)**	**(0.00611)**
Post	-0.00824**	-0.00378	-0.00969**	-0.00383	-0.00607
	(0.00385)	(0.00376)	(0.00454)	(0.00501)	(0.00683)
Size	0.0511***	0.0599***	0.0673***	0.0628***	0.0743***
	(0.00696)	(0.00548)	(0.00495)	(0.00755)	(0.00774)
Profitability	-0.252***	-0.243***	-0.269***	-0.338***	-0.324***
	(0.0327)	(0.0260)	(0.0237)	(0.0322)	(0.0403)
Tangibility	0.116***	0.142***	0.141***	0.147***	0.115***
	(0.0234)	(0.0213)	(0.0190)	(0.0280)	(0.0267)
Market-to-book ratio	0.00407***	0.00493***	0.00563***	0.00684***	0.00795***
	(0.00105)	(0.000842)	(0.000737)	(0.00129)	(0.00139)
Observations	22,460	38,433	51,439	19,510	16,161
Adjusted R^2	0.904	0.873	0.837	0.884	0.864
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes

Appendix C
Robustness: No firms that are already part of a major stock index

The table reports coefficients from difference-in-differences regressions. MARKET LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. We do not consider treatment firms that are already part of a major stock index. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: market leverage					
Treated x Post	**0.0211*** **	**0.0232*** **	**0.0201** **	**0.0299*** **	**0.0427*** **
	(0.00562)	**(0.00654)**	**(0.00819)**	**(0.00772)**	**(0.00996)**
Post	-0.00910**	-0.00345	-0.00607	0.00431	-0.00649
	(0.00449)	(0.00381)	(0.00417)	(0.00474)	(0.00711)
Size	0.0643***	0.0705***	0.0762***	0.0704***	0.0826***
	(0.00917)	(0.00628)	(0.00564)	(0.00850)	(0.00878)
Profitability	-0.171***	-0.203***	-0.227***	-0.275***	-0.295***
	(0.0301)	(0.0254)	(0.0256)	(0.0305)	(0.0481)
Tangibility	0.131***	0.140***	0.158***	0.121***	0.146***
	(0.0295)	(0.0282)	(0.0275)	(0.0340)	(0.0360)
Market-to-book ratio	-0.00282*	-0.00289***	-0.00322***	-0.00362***	-0.00294**
	(0.00155)	(0.000907)	(0.000709)	(0.00118)	(0.00116)
Observations	17,463	29,621	38,621	15,075	14,053
Adjusted R^2	0.951	0.915	0.872	0.942	0.928
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes

Appendix D
Propensity score matching with caliper specification

The table reports descriptive statistics for 3,815 non-financial stocks exogenously added to an index and their nearest neighbor control stocks before and after propensity score matching using an additional caliper specification. The control stocks are from the same country, year, and industry as the treated stocks, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. The matching basis for control stocks are all stocks in the Worldscope country lists without those from the treatment group. The MEAN of treated and (unmatched and matched) control stocks, the mean DIFFERENCE between treated and control stocks, and the normalized difference in coefficients according to Imbens and Wooldridge (2009) are presented in the table. Normalized differences not exceeding a quarter are considered to be not significantly different from zero.

	Before matching				After matching			
Variable	Mean (treated)	Mean (un-matched)	Dif.	Norm. dif.	Mean (treated)	Mean (matched)	Dif.	Norm. dif.
Size	13.24	11.71	1.54	0.23	13.24	13.18	0.06	-0.01
Profitability	0.11	0.02	0.09	1.12	0.11	0.11	0.00	-0.01
Tangibility	0.30	0.29	0.01	0.10	0.30	0.27	0.02	0.11
Market-to-book ratio	3.30	3.20	0.11	0.00	3.30	3.37	-0.07	0.00

Appendix E
Robustness: Difference-in-differences regressions based on propensity score matching with caliper specification

The table reports coefficients from difference-in-differences regressions. MARKET LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The event year (0) is not included in the analysis. TREATED is a dummy variable set to one for treatment stocks, and zero otherwise. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, the market-to-book ratio, and additional caliper specification. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-1,1]	[-2,2]	[-3,3]	2 vs. -1	3 vs. -1
Dep. variable: Market leverage					
Treated x Post	**0.0107****	**0.0158*****	**0.0141****	**0.0206*****	**0.0261*****
	(0.00453)	**(0.00526)**	**(0.00638)**	**(0.00607)**	**(0.00774)**
Post	-0.00625	-0.00407	-0.00277	-0.00216	-0.00660
	(0.00487)	(0.00421)	(0.00459)	(0.00545)	(0.00778)
Size	0.0744***	0.0733***	0.0812***	0.0742***	0.0872***
	(0.00844)	(0.00685)	(0.00576)	(0.00832)	(0.00871)
Profitability	-0.179***	-0.191***	-0.212***	-0.266***	-0.258***
	(0.0303)	(0.0255)	(0.0236)	(0.0300)	(0.0388)
Tangibility	0.118***	0.135***	0.139***	0.104***	0.107***
	(0.0289)	(0.0298)	(0.0287)	(0.0341)	(0.0356)
Market-to-book ratio	-0.0034***	-0.0032***	-0.0034***	-0.0034***	-0.0054***
	(0.000979)	(0.000826)	(0.000684)	(0.00124)	(0.00125)
Observations	13,296	22,036	29,538	11,212	9,267
Adjusted R^2	0.902	0.869	0.836	0.886	0.866
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes

Appendix F
Placebo test: Difference-in-differences regressions for stocks exogenously added to an index

The table reports coefficients from placebo difference-in-differences regressions (from year -10 to year -4). MARKET LEVERAGE is the dependent variable. The sample is restricted to firm-year observations in the time window presented in the column titles. The pseudo event year (-7) is not included in the analysis. Treatment stocks are experiencing exogenous index inclusion, while control stocks did not experience an index change but have similar firm characteristics. Control stocks are from the same country, year, and industry, and are matched based on a propensity score using the natural logarithm of the dollar value of total assets, profitability, tangibility, and the market-to-book ratio. POST is a dummy variable set to one in firm-years after a change in index membership. Control variables are lagged by one year. Huber/White robust standard errors clustered by firm are shown in parentheses. ***, **, and * indicate significance at the 1%-, 5%-, and 10%-levels, respectively.

Model	1	2	3	4	5
Window (years)	[-8,-6]	[-9,-5]	[-10,-4]	-5 vs. -8	-4 vs. -8
Dep. variable: Market leverage					
Treated x Post	**-0.0208***	**-0.0143**	**-0.0138**	**-0.0146**	**0.0169**
	(0.0114)	**(0.0105)**	**(0.0129)**	**(0.0118)**	**(0.0164)**
Post	0.0203***	-0.0115	0.000865	-0.0146	0.0224*
	(0.00763)	(0.00828)	(0.00945)	(0.0106)	(0.0124)
Size	0.0559***	0.0718***	0.0912***	0.0950***	0.128***
	(0.00950)	(0.00808)	(0.00819)	(0.0107)	(0.0133)
Profitability	-0.187***	-0.114***	-0.193***	-0.243***	-0.416***
	(0.0474)	(0.0338)	(0.0396)	(0.0543)	(0.0673)
Tangibility	0.125**	0.189***	0.237***	0.0907*	0.0900
	(0.0509)	(0.0434)	(0.0434)	(0.0537)	(0.0650)
Market-to-book ratio	-0.000868	-0.00120	-0.0038***	-0.00172	-0.00417
	(0.00128)	(0.000779)	(0.00107)	(0.00179)	(0.00277)
Observations	6,162	8,699	9,911	4,468	3,246
Adjusted R^2	0.910	0.888	0.864	0.907	0.901
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes